RESEARCH ARTICLE

A Comprehensive Study of Caecal and Intestinal Coccidiosis in Poultry: Incidence and Pathology

Chandravathi T.[1]*, Venkatramireddy B.[1], Jeevanalatha M.[1], Ravi Kumar Y.[2]

Abstract

In the present study, out of 670 birds examined, coccidiosis was recorded in 182 (27.16%) birds, which occurred as caecal coccidiosis in 78 (11.64%) birds and intestinal coccidiosis in 104 (15.52 %) birds. Season-wise, highest infection was recorded during rainy season (48.36%) followed by winter (28.02%) and summer (23.62%). Age-wise infections recorded in <8 weeks, 8-28 weeks and >28 weeks old birds were 60.43%, 27.48% and 12.09%, respectively. In both the forms of coccidiosis the carcass was pale and emaciated. Mucosal scrapings from the caeca and intestines revealed coccidia oocysts. Grossly, in caecal coccidiosis ballooning of caeca with dark petechiae with bloody contents and dried caecal cores were seen. Microscopically, extensive erosion of mucosal epithelium that contained different stages of coccidia was a constant feature noticed. Out of 104 birds affected with intestinal coccidiosis, 81 birds showed lesions throughout the small intestines, while in 23 birds, lesions were restricted to parts of small intestine. Grossly, linear haemorrhages visible through the serosa and ballooning of intestines were noticed. Histopathologically, haemorrhages, necrosis, fusion of villi and hyperplastic changes were noticed in the mucosa. Various developing stages of coccidia in epithelial cells were observed along with severe infiltration of macrophages, plasma cells and heterophils. Study revealed that the prevalence of coccidiosis is quite high in backyard poultry of Waramgal area of Telengana and that based on clinical signs, coprology, and patho-morphological analyses coccidiosis can be diagnosed.

Key words: Caecum, Chicken, Coccidiosis, Histopathology, Intestines.

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Introduction

In recent years, backyard poultry production has gained significant promotion as a means of sustaining and enhancing rural livelihoods. Backyard poultry contributes notably to supplementary income generation and family nutrition, particularly for the poorest segments of society. It plays a vital role in the rural economy and women empowerment and contributes 30% to national egg production. Despite this, rural backyard poultry often remains neglected.

Domestic chickens exhibit diverse feeding habits, including consuming decaying vegetables and faeces, which can carry parasitic stages, predisposing them to infections. Coccidiosis, an economically significant protozoal disease caused by the genus *Eimeria*, is one of the most severe and frequently recorded diseases in poultry globally, characterized by haemorrhagic enteritis. This disease is universally important in poultry production and can affect any type of poultry in any facility (McDougald and Fitz-Coy, 2012). Avian coccidiosis is classified into caecal and intestinal forms, caused by seven different *Eimeria* species, which vary in pathogenicity and parasitological characteristics (Donal and McKenzie, 2007; Jadhav, 2020). Among these, *E. tenella*, *E. acervulina*, *E. maxima*, and *E. necatrix* are the most prevalent in the field, each infecting a specific region of the avian intestine (Donal and McKenzie, 2007). The morbidity of coccidiosis is estimated to be 50-70%, posing a major threat to birds aged 15 to 50 days (McDougald and Fitz-Coy, 2012). The *Eimeria* parasites multiply in the intestinal tract, causing damage to the small intestine and cecum, leading to pathological changes such as local malformation of mucosal architecture, interruption of digestive processes or nutrient absorption, and systemic effects like bloody diarrhoea, weight loss, and death of chickens. Secondary bacterial infection with *Clostridium perfringens* may also occur, predisposing birds to other gut infections such as necrotic enteritis. Backyard poultry, typically maintained in free-range systems, are not routinely vaccinated. Despite the growth of the backyard poultry sector, few studies have focused on poultry coccidiosis. This study was conducted

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to determine the incidence of coccidiosis in necropsied backyard chickens and to study the associated gross and histopathological lesions.

Materials and Methods

Dead and sick backyard chickens were procured from villages in and around Warangal, along with necropsies performed on backyard chickens at the Department of Veterinary Pathology, College of Veterinary Science, Mamnoor, Warangal, Telangana (India). The study spanned from January 2021 to December 2023, examining a total of 670 backyard chickens, including local breeds, Gramapriya, and Rajasri, of varying ages and of either sex. During necropsy, detailed examinations were conducted to detect the presence of endoparasites. Tissue samples from organs showing suspected parasitic lesions were collected, fixed in 10% neutral buffered formalin, sectioned at 5-6 µm thickness, and stained with hematoxylin-eosin for further histopathological analysis.

Results and Discussion

Incidence

Coccidiosis was observed in 182 birds (27.16%) out of 670 backyard chickens examined. Both caecal (78 birds, 11.64%) and intestinal (104 birds, 15.52%) forms of coccidiosis were identified in backyard poultry. In previous studies, different authors recorded varying prevalence rates. Sharma *et al*. (2015) found 53.61% infection in backyard farms in the Jammu region, Mankani *et al*. (2021) reported 45.86% positive samples from backyard poultry in Kerala, Jadhav (2020) noted a 19.59% prevalence of coccidial infection in Maharastra, and Das (2021) recorded a prevalence of 30.12% in backyard poultry in Meghalaya. Singh (2023) reported a 77.9% incidence of coccidiosis in West Bengal birds based on fecal sample examinations. These reports show different prevalence rates and prevalence of coccidiosis varies annually and is influenced by environmental conditions and managemental systems. Coccidiosis is more prevalent on clay and brick floors compared to concrete floors. Poor management practices and limited use of anticoccidials contribute to the higher occurrence rate observed in backyard poultry. The humid climatic conditions also favour rapid sporulation of oocysts and quick transmission of the disease (Adhikari *et al*., 2008). Season-wise, the highest infection rate was recorded during the rainy season (88/182 birds, 48.36%), followed by winter (51/182 birds, 28.02%) and summer (43/182 birds, 23.62%). Similarly, highest infection rate during monsoon (33.87%), followed by spring (32.77%), winter (27.78%), and autumn (18.37%) was reported by Das (2021). The high infection rate in the monsoon season may be due to wet floors, humidity, and litter in poultry farms, which favour the growth and development of *Eimeria* oocysts. The disease generally peaks during the rainy season when environmental conditions such as moisture and humidity facilitate oocyst sporulation.

Age-wise prevalence rate recorded was highest in birds less than 8 weeks old (110/182 birds, 60.44%), followed by aged 8-28 weeks (50/182 birds, 27.47%), and low in birds older than 28 weeks (22/182, birds, 12.08%). These findings were in accordance with previous studies by Wondimu *et al*. (2019), Jemimah *et al*. (2020) and Singh (2023). Younger birds were more susceptible to *Eimeria* spp. due to their immature immune systems, making them vulnerable to infection even with less pathogenic strains (Das, 2021).

Symptoms

In the present study, symptoms such as droopiness, listlessness, loss of appetite, loss of yellow colour in shanks, pale combs and wattles, ruffled feathers, huddling, blood or mucus in faeces and diarrhoea were observed. Birds were emaciated and dehydrated. Other signs noticed were poor feed digestion, weight loss, and reduced feed efficiency. These findings were in line with the previous reports of Sharma *et al*. (2015) and Shahraki *et al*. (2018), who observed similar symptoms. Moses *et al*. (2015) stated that haemorrhagic diarrhoea, malabsorption and decreased weight gain are the most clinically significant manifestations of coccidiosis. Examination of faecal samples revealed various coccidial oocysts (Fig. 1).

Intestinal Coccidiosis

Intestinal coccidiosis had an incidence of 15.52% (104 birds) among the 670 birds examined. Emaciation and pale combs were evident in all cases. Lesions were present throughout the small intestines in 81 birds, while in 23 birds, lesions were restricted to specific parts of the small intestine. Grossly, the affected intestines appeared darkened with congested serosa vessels, ballooning and ballooned intestines had thin walls. Haemorrhagic spots and linear haemorrhages were visible through the serosa (Fig. 2). The mucosa was severely congested and haemorrhagic on cut section. In mild cases, the intestinal wall showed congestion. Petechial to ecchymotic haemorrhages were noted on the mucosa. Intestinal contents ranged from bloody (Fig. 3) and fluidic to dark blood clots, frothy contents, or empty intestines with dried blood clots. Intestinal scrapings confirmed the presence of coccidia oocysts. These findings are consistent with reports of McDougald and Fitz-Coy (2012) and Olabode *et al*. (2020).

Histopathologically, the intestinal lumen contained desquamated cells along with different stages of coccidia and haemorrhages (Fig. 4, 5). Superficial epithelial erosion, necrosis at villi tips, villi fusion, and hyperplastic changes in the remaining epithelium were observed. Various developing stages of coccidia were present in villous and glandular epithelium. Severe infiltration of macrophages, plasma cells, and heterophils were noted in the mucosa, along with marked haemorrhages and severe blood vessel congestion throughout the intestine. These lesions were similar to those reported by Moses *et al*. (2015) and Shahkari *et al*. (2018).

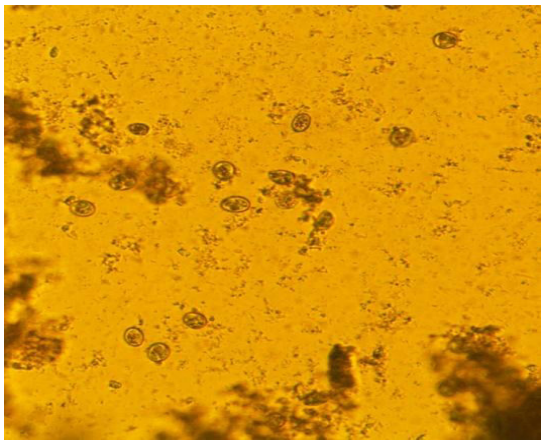

Fig.1: Fecal sample showing coccidia

Fig. 2: Bird showing swollen, ballooned intestines with haemorrhages

Fig. 3: Intestines showing hemorrhagic contents

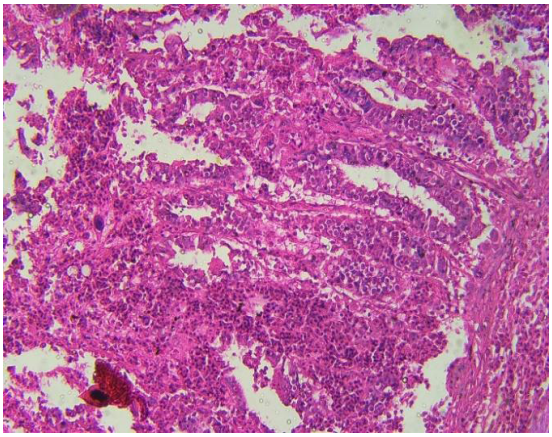

Fig. 4: Intestines showing development stages of Eimeria species in the epithelial cells and necrosis of villi HE X 200

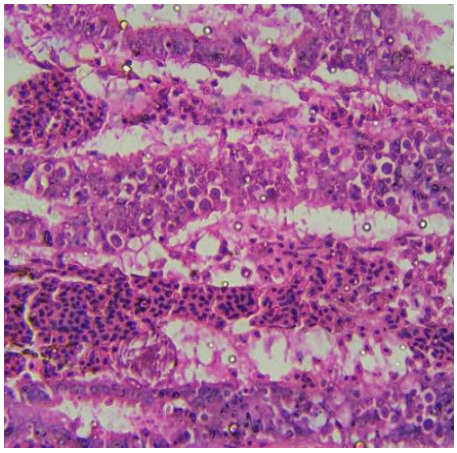

Fig. 5: Intestines showing development stages of Eimeria species in the epithelial cells and haemorrhages between the villi HE X 400

Fig. 6: Caecum showing ballooning and serosal haemorrhages

Caecal Coccidiosis

At necropsy, emaciated and dehydrated carcasses with pale breast muscles and prominent keel bones were observed. The caeca were enlarged, distended, and occasionally ballooned (Fig. 6). Dark petechiae were visible on the serosa surface, with large areas of coalescence in severely affected birds. Necrosis of the caeca was noted in some cases. On cut section, luminal contents varied from frank blood and large blood clots to hard, dried caecal cores. The caecal wall was thickened and oedematous, with mucosal scrapings revealing coccidia

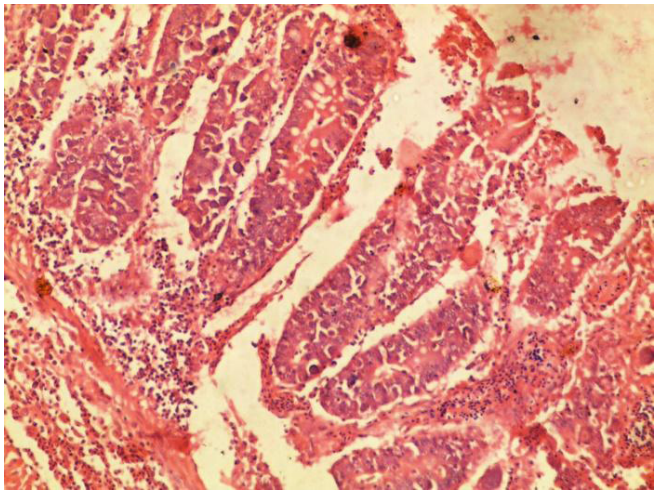

Fig. 7: Caecum showing development stages of Eimeria species in the epithelial cells, haemorrhages in mucosaand infiltration of inflammatory cells HEX 200

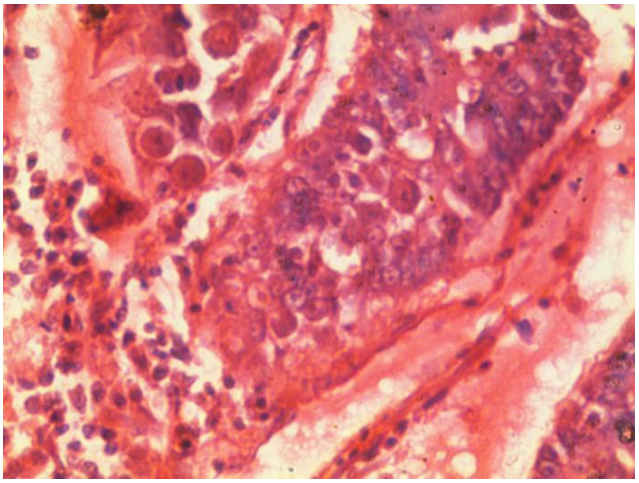

Fig. 8: Caecum showing schizonts in crypts HEX 400

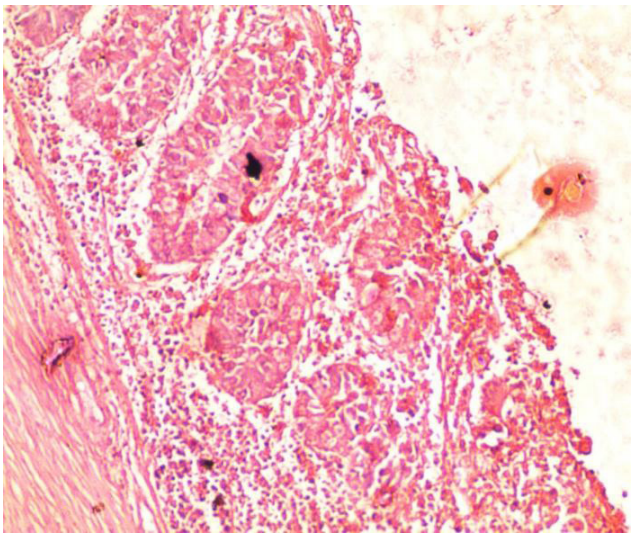

Fig. 9: Caecum showing coccidia in crypts and infiltration of inflammatory cells in mucosa and submucosa HE X 400

oocysts. These findings were similar to the observations of Bawer *et al.* (2021) and Das (2021).

Microscopically, extensive erosions of mucosal epithelium containing different stages of coccidia were consistently observed. Haemorrhages were present within the caecal lumen, villi tips, and mucosa (Fig. 7). Surviving mucosal and glandular epithelium showed various developmental stages of coccidian (Fig. 8). The mucosa contained pink staining edematous fluid, villi fusion and blunting of villi was noted along with intense infiltration of mononuclear cells, eosinophils and plasma cells in the mucosa and submucosa (Fig. 9) with severe congestion of blood vessels throughout the caeca. In severe cases, complete erosion of the mucosa left the basement membrane exposed. These findings were consistent with previous studies of Gari *et al*. (2008), Moses *et al*. (2015) and Bawer *et al*. (2021).

Conclusion

Based on clinical signs, coprology, and pathomorphological analyses coccidiosis can be diagnosed. This study shows the higher prevalence of the coccidiosis along with the significance of pathological findings in backyard poultry. The pathological changes in the intestines decrease the absorption of nutrients, feed conversion ratios and increase the managemental costs. Hence awareness programmes are needed for rural poultry farmers regarding the managemental acts to be taken care of to prevent the coccidiosis.

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